Strategie Antibiotikaresistenzen StAR

Factsheet
Swiss Antibiotic Resistance Report 2022

Antibiotic resistance occurs when bacteria become immune or less sensitive to antibiotics. Such resistant bacteria can make it more difficult or even impossible to treat infections. This is why the Swiss Antibiotic Resistance Strategy was launched in 2015. One part of the strategy involves monitoring antibiotic resistance and antibiotic consumption in humans, livestock and domestic animals, and in the environment. The results of this monitoring and surveillance are published every two years in the Swiss Antibiotic Resistance Report.

Evolution of antibiotic consumption in Switzerland

In human medicine, antibiotic consumption significantly decreased during the COVID-19 pandemic.

In human medicine, total antibiotic consumption (in both inpatient and outpatient settings) fell by 19 % between 2019 and 2021, to 8.6 defined daily doses per 1,000 inhabitants per day (DID). The measures to tackle the COVID-19 pandemic, such as social distancing and mask wearing, are likely to have played a significant role here, as they generally led to lower infection numbers[i]. Compared with other countries in Europe, Switzerland has one of the lowest levels of antibiotic consumption (EU average in 2020: 16.4; lowest and highest values in EU countries: 8.5 and 28.9 respectively)[ii].

In particular among the antibiotics that are critical to the development of antibiotic resistance (the 'Watch group'), a decline of almost 40 % has been achieved in the last 10 years (2012: 5.4 DID; 2019: 4.0, 2021: 3.1). The share of these critical antibiotics as a percentage of all antibiotics prescriptions was 36 % in 2021, having fallen below the WHO target of 40 % for the first time in 2019.

85 % of the antibiotics consumed were used in outpatient settings.

In Switzerland, consumption per capita in outpatient settings is comparatively low, at 7.3 DID (2020: 7.5; 2019: 9.0). In the EU, the average was 15.0 (2020).

There are marked regional differences in Switzerland in terms of consumption: in the French- and Italian-speaking parts of the country, antibiotic consumption per inhabitant is above the national average, while in German-speaking Switzerland, it is below. In 2021, most antibiotics were used to treat urinary tract infections (40 %), followed by diseases of the upper respiratory tract (19 %). The prescribed classes of antibiotics correspond largely to the national guidance.

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At 1.3 DID in 2021 (2020: 1.5; 2019: 1.6), per-capita consumption in Swiss hospitals is approximately in line with the EU average (2020: 1.6 DID). Before the decline during the COVID-19 pandemic, consumption was largely stable between 2012 and 2019. Measured relative to bed-days, too, average antibiotic consumption was slightly in decline between 2019 and 2021. The average antibiotic consumption per 100 bed-days was lower in small hospitals (49 defined daily doses per 100 bed-days) than in mid-sized hospitals (50.3) and large hospitals (55.2).

Antibiotic consumption continues to decline in veterinary medicine

Antibiotics are also used to treat bacterial infections in livestock and domestic animals. Around 28 tonnes of antibiotics were used to treat animals in 2021 – a decline of around 6 % compared with 2019. Since 2012, antibiotic use in veterinary medicine has been reduced by around half. In addition, the use of critically important antibiotics, which are particularly important in human medicine, continued to decline between 2019 and 2021, and has decreased by 46 % since 2016. In domestic animals, antibiotic consumption has decreased by 19 % in the last ten years. Only 3 % of the antibiotics used are exclusively authorised for domestic animals.

Every time a veterinarian in Switzerland prescribes antibiotics, this is newly recorded in the antibiotic consumption information system (IS ABV). The data show that the majority of antibiotics used are for cattle (78.8 %) and pigs (13.3 %). Critical antibiotics account for 4.6 % of the total amount. In all species, primarily first-line antibiotics are used. This shows that Swiss vets are taking account of the therapeutic guidance.

Contamination of the environment by antibiotics

Antibiotics in rivers, lakes and groundwater can be reduced by retrofitting sewage treatment plants.

After antibiotics have been taken by humans and animals, they are partially excreted and thus end up in wastewater and soil. Antibiotic concentrations decrease from wastewater to river water through dilution. From river water to ground water, the concentrations decrease further as antibiotics are partly degraded or retained during bank filtration or when they pass through the soil.

Conventional sewage treatment plants can only partially remove antibiotics. Since 2016, sewage treatment plants have therefore been retrofitted with additional treatment steps to eliminate micropollutants such as antibiotics. In 2020, 11 % of Swiss wastewater was purified in such treatment steps; this figure should increase to 70 % by 2040. Measurements in the Rhine show that this treatment significantly reduces concentrations of antibiotics.

Resistance situation

Many microorganisms are naturally present in the environment and on the skin, in the mucosa and in the intestine. Humans and animals need bacteria and other microorganisms, e.g. for digestion. However, if these pathogens enter the body and multiply excessively, they cause an infection. This happens, for example, if the skin or mucosa are damaged, or in people with immunodeficiency. If the bacteria that cause the infection are resistant to certain antibiotics, it becomes difficult, or even impossible, to treat the infection.

Based on modelling, we can estimate the number of deaths and the disease burden caused by infections with resistant pathogens. It is estimated that some 300 people die from resistant infections every year in Switzerland. The disease burden is around 85 infections per 100,000 population. Relative to the size of its population, Switzerland

is therefore less affected by infections caused by resistant bacteria than France or Italy, but is more affected than the Netherlands and Scandinavian countries.

The data collected on humans since 2004 and on animals since 2006 reveal a mixed picture: while antibiotic resistance has significantly increased in some bacteria, it has remained stable or decreased in others. Resistance rates have stabilised in recent years.

Resistance rates have stabilised in human medicine

The rate of invasive infections caused by resistant gram-positive bacteria has significantly decreased in the last 15 years, particularly those caused by methicillin-resistant *Staphylococcus aureus* (MRSA), for which resistance rates have halved. The rate of vancomycin-resistant Enterococci (*E. faecium*) has not increased either. Vancomycin-resistant Enterococci caused a major regional outbreak in 2018/19, which is why the situation is being closely monitored.

The resistance rates against fluoroquinolones and third-/fourth-generation cephalosporins in gram-negative *E. coli* and *Klebsiella pneumoniae*, which rose considerably between 2004 and 2015, have fortunately stabilised in the last five years. The resistance of these bacteria to carbapenems (carbapenemase-producing Enterobacterales (CPE)) pose a particular threat to public health, which is why they have been subject to mandatory notification since 2016. The number of reported cases has risen steadily since, although the consumption of carbapenems in human medicine has declined. The figures are low compared to neighbouring countries. However, there are isolated cases of multidrug-resistant bacteria that are very difficult to treat.

Campylobacter resistance increasing slightly in chicken and raw meat

Most bacterial food-borne infections in humans are caused by bacteria of the genus *Campylobacter*. Infection caused by *Campylobacter* bacteria is the most common zoonotic disease in Switzerland and in other European countries and causes gastrointestinal disease in humans. An infection caused by food-borne bacteria can be avoided by carefully following simple hygiene rules when preparing food. Following a decline in 2017–18, fluoroquinolone-resistant *Campylobacter* detected in poultry meat rose again slightly in 2020, to 47.5 % in broiler chickens and 70.5 % in chicken meat with *C. jejuni*. The monitoring of broiler chickens over a decade shows that prevalence of (fluoro)quinolone-resistant *C. jejuni* appears to have reached a plateau at around 50 %. Resistance rates to other antibiotics remain at a low level.

Fortunately, the resistance rates of these bacteria to macrolides – another class of antibiotics that can be used to treat severe infections caused by *Campylobacter* – is still low, and well below the levels in several EU member states.

Contamination of Swiss raw meat with resistant bacteria continues to fall

When animals are slaughtered, bacteria can find their way into the raw meat produced. In 2020, there was a sharp decline in poultry samples contaminated with *E. coli,* which were resistant to various classes of antibiotics: in poultry of Swiss origin this figure was 10.2 % of samples, and in poultry of foreign origin it was 61.8 %. Detection rates in Swiss poultry in particular have significantly decreased in recent years (2014: 65.5 %, 2016: 41.9 %, 2018: 21.1 %). In pork and beef, these values have been very low for some years (under 1 %).

Indicator bacteria collected from healthy animals show a mixed picture in terms of antibiotic resistance.

The monitoring of antibiotic resistance in indicator bacteria from healthy slaughter animals is designed to provide information on the type of resistance found in intestinal bacteria of animal origin. These bacteria do not usually cause disease themselves, but can pass on resistance to other bacteria, including those that can cause disease in humans. Every time antibiotics are used, they can result in selective pressure, giving rise to resistant bacteria in the intestinal flora of the animals concerned. Consequently, *E. coli* as indicator bacteria are a useful instrument with which to observe changes in resistance and to track the spread of resistance.

The resistance rates of *E. coli* in the intestines of broiler chickens, fattening pigs and veal calves evolved differently between 2019 and 2021. While resistance fell in broiler chickens, rates remained more or less stable in fattening pigs and veal calves. As in previous years, no carbapenemase-producing *E. coli* were detected. There has been a clear decline in resistance rates in all livestock species to cephalosporin antibiotics, which are important in human medicine. ESBL/AmpC-producing *E. coli*, which are resistant to cephalosporins and often to other antibiotics (multidrug-resistant), were detected much less frequently in chickens (10 %), calves (23.8 %) and fattening pigs (5.9 %).

Methicillin-resistant *Staphylococcus aureus* is also tested as an indicator bacterium. While MRSA was only detected in 2 % of fattening pig nasal swabs in 2009, the detection rate rose to 53.6 % in 2021 (2019: 52.8 %). MRSA prevalence in veal calves is at a low level.

New methods allow a better understanding of the spread of antibiotic resistance

As part of the National Research Programme on antimicrobial resistance (NRP72), various projects looked at the spread of new forms of resistance using next-generation sequencing (NGS). Among other things, researchers found a high colonisation with resistant pathogens in returning travellers. They also detected transmission of resistant pathogens from patients discharged from hospital to their relatives, and between staff working in veterinary clinics and the animals treated there. To determine the contribution of these routes of transmission more accurately, NGS would need to be systematically expanded. The aim of sequencing must be to gain relevant insights for the control of resistant pathogens and to utilise these for targeted action within the framework of the StAR.

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[i] BAG-Bulletin 30, 26. Juli 2021

[ii] European Centre for Disease Prevention and Control. Antimicrobial consumption in the EU/EEA (ESAC-Net) - Annual Epidemiological Report 2020. Stockholm: ECDC; 2021 https://www.ecdc.europa.eu/sites/default/files/documents/ESAC-Net%20AER-2020-Antimicrobial-consumption-in-the-EU-EEA.pdf